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Late Quaternary sedimentation in the Ulleung Interplain Gap, East Sea (Korea)

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Abstract

The Ulleung Interplain Gap (UIG) is a deep (2300–2700 m) passage which has served as a conduit for deep-water circulation between the Ulleung and Japan basins. A detailed analysis of Chirp (2–7 kHz) subbottom profiles (ca. 6270 line-km) and nine sediment cores (8.6–11.4 m long) together with age data of tephra layers and four AMS ^{14}C from the UIG and the adjacent areas reveals complex sedimentation caused by an interaction between bottom currents and mass flows during the last- and post-glacial periods. From high-resolution subbottom data, rock basement, slide/slump/rock-fall deposits, mass-flow chutes/channels, mass-flow deposits, bottom-current deposits, and a large-scale bottom-current channel system are recognized. Core sediments consist of various deposits of turbidites, muddy contourites, manganiferous contourites, and pelagic/hemipelagic sediments. Based on vertical distribution of sedimentary facies together with a chronostratigraphic framework, core sediments can be divided into Units I ($< \sim 15$ ka) and II ($> \sim 15$ ka).

The extensive mass-flow deposits with slope failures on the entire slopes of topographic highs around the UIG and the dominant turbidites in Unit II ($> \sim 15$ ka) suggest that a relatively large amount of sediment was delivered into the UIG by frequent mass flows (recurrence intervals of ca. 250–500 years in the upper Unit II) during the last-glacial period. Erosion or hampered sedimentation by bottom currents is indicated by the truncated reflectors of channel walls and muddy/manganiferous contourites in the Ulleung Interplain Channel (UIC) along the UIG. Interbedded turbidites in the UIC floor reflect that some large-scale mass flows intermittently entered into the UIC.

The UIC has an asymmetric channel-flank geometry. The southeastern flank shows a gentle, wide mound morphology of mass-flow deposits derived from large-scale slope failures on the slopes of the Oki Bank, reflecting a dominance of downslope gravitational processes over alongslope bottom currents. In contrast, the northwestern flank is characterized by a narrow, steep geometry of mass-flow deposits, where a relatively small amount of sediment derived from the slopes of the South Korea Plateau could not overcome bottom-current activity.

The dominant muddy and manganiferous contourites with rare turbidites in Unit I ($< \sim 15$ ka) reflect intensified bottom currents and infrequent slope failures (recurrence intervals of ca. 1700–5000 years) during the post-glacial period. These

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